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Institutional Trust and Cognitive Motivation toward Water Conservation in the Face of an Environmental Disaster

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Abstract: The agricultural sector in general, and in Iran in particular, is a major consumer of water and now finds itself under significant pressure due to water deficiency. This study used the Protection Motivation Theory to detect reasons for the imprudent consumption of water in Iran and to further its conservation. The Theory was extended for particular application to a seriously affected water basin, the Urmia Lake Basin in Northwest Iran. The factors governing water-saving intention among farmers in the Basin were investigated. Three hundred farmers were selected through a multi-stage, clustered, random sampling method. The results of structural equation modeling illustrated that while the original model variables accounted for 58% of the variance in water-saving intention, this rate increased to 63% in the extended model when institutional trust was used as a variable. Whereas response efficacy showed itself to be the strongest determinant of water-saving intention, all factors except perceived severity were significant in both models. Furthermore, the results of a multi-group analysis revealed that the intention to adopt water conservation measures is commensurate with the distance from the water resource and proximity to the (drying) lake. The findings of the study are expected to provide important information for policymakers looking to tailor policies to work in extreme water deficiency cases like the Urmia Lake Basin.

Keywords: environmental risk; pro-environmental behavior; water conservation; institutional trust; protection motivation theory; Urmia Lake Basin

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1. Introduction

The issue of water scarcity has been addressed by many scholars [1–4]. Just like climate change (CC), water resources at a global scale are influenced by direct human use [5–7], for example, imprudent consumption, overuse, and contamination [8,9].

The hydrological cycle has already been affected by CC [10–12], and most of the world's species, including humans, are experiencing its effects either directly or indirectly and to varying extents [13–15]. Both the current and future availability of water resources have become major international concerns [13,16,17]. Some regions that are already highly affected by CC could be vulnerable to severe water resource depletion and environmental degradation, even before the challenges of CC can be adequately managed [18,19]. Nevertheless, the alleviation of direct (human) pressure on water resources has shown some convincing results [20–26].

In mainly arid and semi-arid regions (e.g., many parts of the Middle East), droughts and political-economic circumstances have adversely affected water and environmental conditions [27,28]. In such regions, water demand–supply management is controversial. Supply-side policies are often set to tie in with government-linked development plans and to local factors like water resource availability/accessibility. Although the relevant authorities try to resolve water supply initiatives through top-down arrangements, these are not matched by bottom-up arrangements on the demand side, which is detrimental to their achievement [29,30] and also to the success of the said policies [31]. Greater demand-side management is key, and in this connection, water consumption reduction is a top priority [32,33], making the impact of the main water consumers a critical factor.

Iran is recognized as a water-scarce territory [34], and its agricultural sector is the main consumer of water resources, using up to 92% of the country's water [35]. Research shows the main culprits to be irresponsible usage or overexploitation of water in the agricultural sector in various regions of the country [36,37]. Nevertheless, despite the seriousness of the issue and the extreme demand for reduction of water consumption in the sector, conserving water is reported to be an operationally "dispiriting task" among Iranian farmers [38,39]. Moreover, while the optimization of agricultural policies and practices has a remarkable potential for building the resilience of water resources [40], the challenge is how to spur improvements among farmers.

There are two main categories involved in controlling demand-led water consumption [41,42]: (i) government instruments imposing price controls [43,44] together with water allocation and use restrictions; and (ii) voluntary user-modulated actions [45,46] such as improvements in irrigation methods and cultivation of crops that consume less water. Both categories have water conservation aims. While regulatory interventions can lead to fast but undesirable or merely temporary water-saving reactions [46], voluntary operations by farmers can lead to water-saving behavior that is more sustainable [47,48]. Voluntary actions themselves may increase in association with increased awareness [48,49]. Environmental awareness can increase the value associated with the conservation of nature and natural resources (i.e., water) because the risk perception of resource users is interlinked with the resource depletion [50,51]. Understanding farmers' perceptions and knowledge of the factors influencing the status of the resource and their willingness to get on board with strategies to conserve it are both essential. Indeed, farmers can be good sources of information when appropriate conservational policies are being developed.

To contribute to creating a concrete source of information to underpin water and environmental conservation, an empirical study was conducted in the Urmia Lake Basin (ULB) in Iran. The farmers' intentions to practice water conservation were assessed using the Protection Motivation Theory (PMT) [52–54]. This framework incorporated a socio-psychological model comprising parameters regarding (i) appraisal of the threat of Urmia Lake drying up; and (ii) the farmers' capacity to cope with the consequences of this in addition to the water scarcity in the ULB.

Urmia Lake is a hypersaline endohydric lake in northwest Iran (Figure 1). It has been suffering from low inflow and high evaporation during recent decades, which have devastated its life and ecosystems [55]. Due to the enormous reduction of the volume of water in the lake, parts of the lake have become desiccated. The lake's immense shrinkage is associated with both natural and human causes [56,57]. Studies show that reduction in the size of the lake is having significant social, economic, health, and environmental effects in the region [58]. The survival of the lake is critical to the population of 6.5 million in the area [59]. While national and international actions are being taken to protect the lake through organizations such as the Urmia Lake Restoration Program (ULRP), Food and Agriculture Organization (FAO) of the United Nations, and the United Nations Development Programme (UNDP), the lake struggles to survive [60]. According to hydrological assessments, using less water in the agricultural sector can help significantly in stabilizing the water level needed for its preservation [61,62]. The ULRP strategy, in place since 2013 [63], aims to reduce agricultural water consumption (which is equivalent to the surface water inflows to the lake) [61]. Nevertheless, although governmental interventions have tried to alleviate the shrinkage of the lake, it is likely to dry up completely.

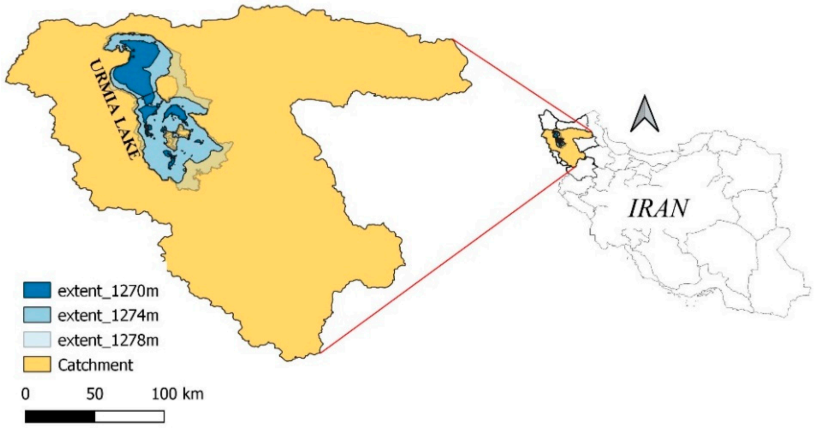

Figure 1. Urmia Lake Basin in Iran.

It is claimed that public instruments can be successful only if farmers follow the strategies proposed in them [64]. Indeed, farmers' cooperation can be decisive for restoration of the Urmia Lake, even if current climatic conditions remain unchanged for a few years [61]. On the other hand, if the water in Urmia Lake were to disappear completely, it would be a disaster for all concerned, as it could increase the danger of saline dust, which is having noticeable impacts on the health and livelihoods of the inhabitants of the region [65–70]. Other side effects could also increase, for example, outward migration, increased unemployment, income reduction, with a corresponding fall in living standards, land remediation costs, healthcare costs, and feelings of hopelessness. Accordingly, the farmers' perception of the risk of Urmia Lake vanishing and the problems that this will cause are of fundamental concern in terms of farmers' decision-making regarding water-saving.

According to Grothmann and Reusswig [71], self-protective behavior can reflect a person's perception of risk to a considerable extent. Moreover, belief in the efficacy and performability of a self-adopted strategy to deal with a problematic issue positively impacts people's protective actions. To characterize the vulnerability that farmers may feel due to the lake vanishing and water shortages that threaten their income, livelihood, and living environment—and also the decisions they may take to control the issue—one needs to consider how they make decisions. Understanding this will help provide insights into the protective actions they undertake when faced with circumstances that have direct effects on their property and income as well as indirect environmental side effects on other aspects of their well-being.

Individual decision makers cope with a threat in two main stages [72,73]: first by perceiving the risk (threat), then by taking appropriate action (which can be an adaptive behavior) in response to it. Individuals' decisions regarding environmental risks can thus be influenced by their perceptions to the extent that they are able to orient their daily behaviors toward an adaptation pattern [74–77]. Thus, if farmers could fully comprehend the issues related to the lake drying up, then this—alongside the already perceived/acknowledged risk of agricultural water deficit, which they already frequently experience—would trigger their motivation toward water preservation.

Based on this idea and using the PMT tool, the researchers evaluated: (i) the factors influencing farmers' intentions to protect water and carry out environmental conservation; and (ii) the effect of trusting in, and thus observing, governmental regulatory instruments. To the best of the authors' knowledge, no study to date has considered the effect of trust in governmental institutions (institutional trust) in a combination of PMT variables to evaluate the water-saving intention of farmers in the ULB. The assumptions and data relating to the method used are described later in this paper.

The analysis was further developed based on the attribute of proximity to the lake, as this affects how farmers perceive the risk and hence how they develop the intention to act. Although this topic has been addressed by scholars [78,79], to the best of the authors' knowledge, a categorical analysis based on the farmers' locations vis-à-vis the lake, has never been conducted at the basin level. The findings of this study will include legitimate and pragmatic sources of information so that policies can be tailor-made for water consumption reduction in the agricultural sector based on farmers' actual water-saving intentions. Furthermore, these findings can be used within similar semi-arid and arid contexts where the agricultural sector is the major water consumer and there are related effects on the environment.

2. Theory, Background, and Hypothesis

The Protection Motivation Theory (PMT) was originally developed to help understand individuals' responses to fears arising from health threats. Its applicability has, however, broadened and it is now also used to assess responses to fear arising from natural risks and CC [71,80,81]. Nelson et al. [82] proposed using the PMT for a systematic analysis of water management campaigns to assess their effectiveness and success in achieving their objectives. The PMT benefits from the addition of parameters related to appraisal of threat and appraisal of coping which, together, help to clarify the intention of individuals to undertake a protective action. Pakmehr et al. [83] used PMT to statistically investigate farmers' adaptation to the CC-induced water shortage. The present study aims to consider the majority of the above-mentioned concepts within an integrative approach that includes the implications of the receding waters of Urmia Lake. For this, we extended the model to combine the impact of trust in governmental measures (institutional trust) on the intention to conserve water using the main settings of the PMT. Accordingly, the farmers' intention to conserve water and their motivation to protect the lake were extensively assessed by both the original and extended models.

Generally, in the realm of health-protective behaviors, there are four main theories that share more similarities than differences [84]. Of these, the health belief model (HBM) and protection motivation theory (PMT) are easier to apply in parallel with the theory of reasoned action (TRA) and the subjective expected utility (SEU) theory. Furthermore, some variables like response efficacy (RE) deserve greater attention in the HBM and PMT [85]. In a comparison between HBM and PMT, the difference arises from the acquisition mechanism. While the HBM incorporates a catalogue of behavior variables, PMT considers the relevant variables in two areas associated with the cognitive processes at the stages of (i) appraisal of threat and (ii) appraisal of coping when confronted by risk [86]. PMT is the only one of those four models that includes self-efficacy (SE) as a separate factor in its evaluation structure [85]. Moreover, the PMT is reported as the supreme environmental psychology theory for determining and illustrating health-protective behavior [87]. The PMT deploys a more rigorous framework for studying human behavior than other similar methods; this is so not only in health-related issues, but also in geographical sciences [88]. It has also been successfully used in assessing behaviors in the face of natural risks [71,89–92].

The PMT is an attractive variant of fear appeal theory, and it uses individual and social variables that jointly intervene in the cognitive decision-making process [83]. The main parameters involved in the organization of PMT are fear-induced, which can be predicted by considering the threat and the corresponding assessment of how to deal with it. In short, a comprehensive theoretical framework that is systematized by both the risk and coping appraisal aspects is used by the PMT [80]. The threat- and response-appraisal factors related to a given risk can embody an adaptive decision-making process, which is useful when studying and understanding intentions and behaviors in people encountering risk [93]. The threat appraisal encompasses an assessment of the severity of a given threat and the vulnerability to it. This stage depends on an individual's judgment regarding the magnitude of the severity of the threat, and the degree of vulnerability they feel to it. Likewise, in the coping-assessment stage, the ability to deal with the intensity and vulnerability related to the distinct threat is estimated. For this, the person uses tools such as the efficacy they can bring to deal with the risk or their ability to afford the costs related to the measures needing to be taken, as well as the efficiency of the strategy and actions to overcome the risk. If they assess the coping process as viable, then they may make corresponding protective arrangements.

As a whole, there are five main constructs framing the body of the PMT (Figure 2). Two of them, namely (i) Perceived Severity (PS) and (ii) Perceived Vulnerability (PV) are the threat-appraisal factors, and the other three, perceived (iii) Response Efficacy (RE); (iv) Self-Efficacy (SE); and (v) Response Costs (RC) are used for the coping-appraisal tools.

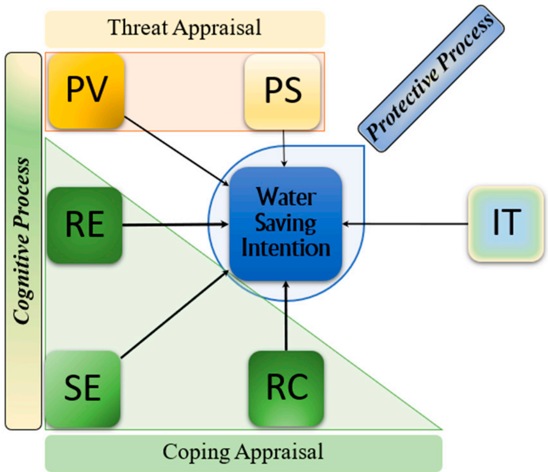

Figure 2. The organization of the Protection Motivation Theory.

The PS associated with risk reveals the extent to which a person may reasonably assume an upsurge in harm, and the PV indicates the anticipated impact of that hazard in terms of significant negative consequences for personal or related social/environmental initiatives. Moreover, RE reflects the expected adequacy of a solution to cope with the negative consequences of the risk, and SE refers to the belief in the performability of the prescribed solution based on personal competence and also the costs, RC, associated with solution integration.

For instance, in the context of ULB, PS can be related to the effects of the drying up of Urmia Lake on the hydro-climatic and environmental characteristics of the region, which can lead to less arable land being available, especially if there are salt dust storms. Furthermore, it can assess the effect of such dust storms on the health of inhabitants or livestock, which can ultimately be problematic for day-to-day living, causing, among other things, hardship, poverty, and conflicts. Thus, if farmers perceive themselves to be vulnerable (PV) to these dimensions (PS), this self-reinforcing process can motivate their intention to protect the lake by saving water as a projected solution in this context. However, in the same way, they can evaluate the possibility of reducing their water consumption using sustainable operations. To do this, they may consider the effectiveness of a solution (RE), such as changing farming methods, products, and so on, in connection with its real cost (RC) and their potential to implement the solution (SE). Accordingly, if all this knowledge can be put into practice, farmers may be persuaded to undertake water-saving measures.

It is worth mentioning that although the utility of both the threat appraisal and the coping appraisal have been addressed in the literature, the coping appraisal is reported as the dominant estimator of intentions for protective behaviors [85,94]. Based on this, PMT is appraised as a worthwhile device for investigating the water-saving approach within a water-stressed environment, as it emphasizes coping constructs as essential components of persuasive communication [94–96] for inculcating or preserving water protection behaviors.

Risk communication is a leveraging instrument for raising awareness of the risk. In water-scarce regions such as Iran, despite governmental arrangements to combat the effects of CC and droughts, the conservation of water resources has, unfortunately, not been particularly successful [39]. In fact, encouraging compliance with governmentally tailored water and environmental conservation programs requires an understanding of the factors influencing farmers' water conservation behavior. Correspondingly, the mechanism of motivation toward change can be identified through the elaboration of a motivational tool. Increasing the level of awareness is proposed as just such a motivational tool [97,98]. However, the main issue is the imponderability of the solutions. To this end, "trust" in responsible authorities is declared as being a catalyst [99,100]. Not only in the water domain but also in other areas, trust has shown itself to be a substantial predictor of protective behaviors. For instance, according to Siegrist et al. [101], trust is a major parameter for estimation of the perceived risks and advantages of a technology; Westcott et al. [102], for example, emphasized trust in emergency services to save animals during bushfires.

Additionally, Lorenzoni et al. [103] discussed the role of distrust of government information with respect to CC issues in terms of the way it curtails public participation in policy outcomes. Moreover, it is argued that trust will, in due course, promote the acceptability of certain issues and assist with knowledge acquisition [104]. In fact, trust acts as a kind of a magnet in the water community that helps draw together both demand- and supply-side players in a structured configuration to confront a common loss. In this area, Paton [105,106] outlines the role of trust in mediating the relationship between the structural placement of the participants and the preparedness for natural hazards. Consequently, trust is recognized as an influential component in the formulation of an evaluation tool to analyze the motivation to protect a common resource. This study thus uses trust in governmental entities in its extended form to assess the farmer's intention to adapt to save water and preserve the environment. Even though institutional trust (IT) has been emphasized in the literature, it has not received due attention in the PMT user community, particularly in behavioral studies on agricultural water conservation. In this study, the authors adapt it to PMT settings.

To conclude: the research was carried out in line with the following hypotheses (Hs), namely that motivation to protect in line with the restoration of a natural ecosystem (Urmia Lake) through agricultural water saving under drought and water scarcity will be likely if (i) the severity (PS) of disaster associated with the drying up of the (hypersaline) lake and loss of freshwater resources is fully understood [H_1]; (ii) the significant vulnerability (PV) linked to the water deficit/shortage and to the environmental side effects is fully grasped [H_2]; (iii) the remediation prescribed (RE) is diagnosed as having the potential to work efficiently [H_3]; (iv) the implementation of the solutions is judged feasible and reasonable (SE) and (v) the affordability of the associated costs (RC) is also identified as being feasible and reasonable [H_4 and H_5]; and (vi) there is an acceptable level of trust in institutions (institutional trust) that can facilitate/accommodate this water-saving regime [H_6]. For this concept to work, it is assumed that except for the response costs (RC), which can have a negative effect on intentions toward adaptation, the other factors (PS, PV, RE, SE, and IT) will be positively associated with motivation toward water and environmental conservation.

3. Method

3.1. Participants

Following the literature and desk reviews, and in order to implement an evidence-based assessment of the farmers' intention to save water and to preserve the lake, a quantitative cross-sectional survey was designed. Accordingly, 300 farmers were selected for the survey through a multi-stage, clustered, random sampling method in agriculturally important locations. The zones of focus are located in western catchments of the Urmia Lake Basin—around Urmia City, the capital of West Azerbaijan province—where the availability of surface water, and also the extent of the incursion of saline dust storms driven from the lake shores, vary according to proximity to the lake (Figure 3). This attribute is associated with the decline in surface water volume by the time it reaches the lake. As the source of the lake's surface water is mainly the mountains on the western side of the lake, the waters become less and less plentiful as they near the lake as a result of upstream abstractions, evaporation loss, infiltration, etc. This arrangement was investigated in such a way that it could cover the study objectives related to the effect of proximity to water sources and the degraded lake.

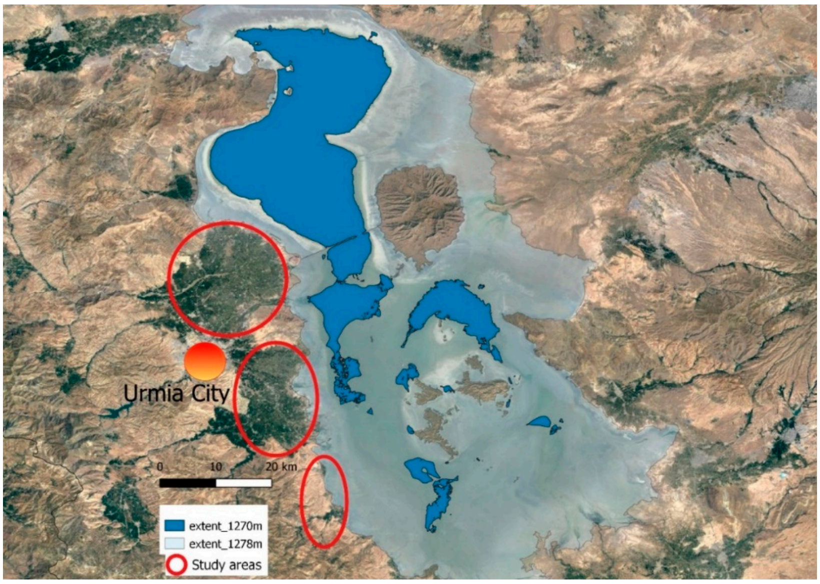

Figure 3. Case study catchments, western side of Urmia Lake, Iran.

The participants were all men aged from 24 to 75 years old, with a mean age of 54.06 years and a standard deviation (SD) of 9.73 years from the mean (the female farmers in the selected catchments refused to participate in the survey). The associated level of education of participants was in the following range: 5% not educated, 26% high school education, 36% diploma, 22% upper diploma certificate, 10% bachelor's degree, and 1% graduate degree. The mean family size of the sample was 3.97 persons per family. In terms of land tenure, more than 70% of the participants were the owners of their lands, and except for six farmers who only were utilizing surface water resources for irrigation, most of them were extracting groundwater for their needs, with 32% utilizing water from both sources.

3.2. Data and Questionnaire

The main constructs and their appropriate associated variables were derived based on an extensive study of PMT applications in water and environmental concerns, with a particular focus on drought and water scarcity. Moreover, to enrich the appropriateness of variables, technical discussions were carried out with both academic scholars and experts from agricultural organizations (including environmental and socioeconomic specialists) together with some farmers in the region. Given the six hypotheses [H1–H6] outlined in Section 2, and in line with the information obtained via literature/desk reviews and expert-user knowledge, a structured questionnaire encompassing the relating parameters and other socioeconomic features was elaborated for data collection. The indicators and measurement scales were validated using properties employed in former investigations [83,107–110]. Correspondingly, a utilitarian pilot assessment was conducted to scrutinize the internal reliability of the questionnaire by means of Cronbach's alpha test score. The results confirmed the range of acceptable to excellent rates with respect to the outputs. In general, this test displayed a scale of 0.651 to 0.917 (Table 1), which safeguards the transparency, relevancy, and credibility of the final questionnaire.

Table 1. The internal reliability of latent variables in PMT setup of the study.

Variable	Item
	Please express the extent of your agreement with the item (strongly disagree—strongly agree (1–5)
Risk Appraisal	Risk assessment according to the consequences of the disappearance of Lake Urmia and the increase of salt dust in the environment:
	PS (α: 0.839, mean: 4.213, SD: 0.822)
1	The extent of disagreements and conflicts will increase among the inhabitants of the villages and rural districts.
2	Hardship and poverty will increase in the region in addition to crimes such as theft and other wrong-doing.
3	Summers will be warmer, winters drier, and environmental conditions will become more difficult for living.
	PV (α: 0.775, mean: 4.222, SD: 0.696)
1	The soil quality and the extent of arable land will be decreased.
2	You or your family members will be prone to cardiovascular, respiratory, skin, and other diseases.
3	Your costs will have to increase to deal with the adverse effects of the lake drying up on livestock, land, and crops.
Coping Appraisal	To save the lake by means of modification of agricultural practices and water saving:
	SE (α: 0.651, mean: 2.847, SD: 0.963)
1	If I wish to, I can easily change my farming and irrigation methods.
2	I'm sure I can change the way I usually farm in a way compatible with reducing water consumption.
	RE (α: 0.917, mean: 3.679, SD: 1.162)
1	Fallow farming
2	Modification and optimization of crop cultivation methods
3	Cultivation of alternative and fewer water-consuming crops
4	Adopting protection measures to lessen the evaporation of water around the crop/plant roots
5	Collecting and (re)using the recycled water sources for irrigation, such as rainwater or sewage
	RC (α: 0.802, mean: 3.109, SD: 1.064)
1	I'm not used to changing my farm irrigation methods.
2	Changing my method of irrigation will reduce my income.
3	Learning the skills and methods of cultivation and growing of the alternative or low-water consuming crops is time-consuming and tedious for me.
	Intention (α: 0.875, mean: 3.067, SD: 1.132)
1	I intend to provide the necessary items to cultivate alternative crops and fewer water-consuming ones.
2	I intend to use recycled sources of water such as sewage or rainwater for irrigation.
3	I intend to participate in meetings and training courses about agricultural water consumption reduction.
4	I plan to start optimizing my farm's canals/irrigation system soon.
	Added Construct (in the extended form)
	IT (α: 0.889, mean: 2.528, SD: 1.296)
1	I trust governmental institutions.
2	The information provided by governmental agencies is reliable.

To mitigate the statistical problem of extreme skewness, during the questionnaire formulation, a 5-point Likert scale (1–5: strongly disagree–strongly agree) was tailored to all variables of the theory. We respected the farmers' right to accept or deny being interviewed and reassured them of their anonymous status. The survey was conducted by researchers personally in the chosen locations through face-to-face interviews during the early months of 2022. It should be mentioned that the participants received no financial or other inducements to engage in the process. The data were generally collected at farmers' dwellings, and questionnaires took about 40 min to fill in.

4. Analysis Methodologies and Results

Following the early phase statistical analysis of the participants' socioeconomic circumstances (e.g., age, education, land tenure), as mentioned before, the internal reliability of constructs was assessed through Cronbach's alpha coefficient using IBM SPSS Statistics 27 [111]. Additionally, a Pearson's correlation test was conducted to investigate the relationship between the latent variables. The results of this test revealed that, except for SE, the contributing variables were significantly correlated with the water-saving intention (Table 2).

Table 2. Pearson's correlations.

Variable		PS		PV		SE		RE		RC		IT		Intention
1. PS	Pearson's r	-												
2. PV	Pearson's r	0.584	***	-										
3. SE	Pearson's r	−0.090		0.063		-								
4. RE	Pearson's r	0.748	***	0.498	***	−0.076		-						
5. RC	Pearson's r	0.097		−0.176	**	−0.354	***	−0.002		-				
6. IT	Pearson's r	0.405	***	0.271	***	0.287	***	0.517	***	−0.281	***	-		
7. Intention	Pearson's r	0.488	***	0.391	***	0.049		0.535	***	0.201	***	0.170	**	-

** $p < 0.01$, *** $p < 0.001$.

Furthermore, to assess the effects of those variables on intention—as a dependent variable—and to test our hypothesis, the structural equation modeling (SEM) method was applied using IBM SPSS Amos 27 [112]. The hypothesis was modeled in two forms: (i) the original form in which the five main constructs of PMT affect the intention (Figure 4), and (ii) the extended form, including the institutional trust (IT) as an influencing factor on water-saving intention (Figure 5). SEM is a comprehensive multivariate path analysis method that incorporates a statistical approach to testing hypotheses about influences among dependent variable(s) and latent factors/constructs [113]. In the "International Encyclopedia of Education–Third Edition" [114], it is indicated that SEM is an extension of factor analysis and has the objective of testing evidenced theories by pragmatic data. The measurement model in the SEM framework is a confirmatory factor analysis (CFA) model in which the latent variables are deduced from the conjectured variables [115]. Unidimensionality of the indicators of each factor is an essential requisite of this method, and the validity of the constructs are gauged in the model based on this default. Brown [116] argued that CFA is a tool that can help further verify the latent structure of a test instrument (e.g., a questionnaire) by taking into account the relationship between factors and their underlying variables (factor loadings). These factors and their reflecting variables, which together make up the measurement model, can be correlated in the CFA mechanism. The issue of construct validity includes several requirements. In this context, a key point is the fit of the measurement model according to the observed data. This fit should be consistent with the criteria emphasized by the majority of scholars. In this domain, the smaller the model test statistic, the better the fit [117]. Moreover, there are other indicators that should be considered as approximate fit indices [118]. These indices provide complementary components to evaluate the model fit. To this end, some rates commonly specified by experts [117,119–121] are summarized as the comparative fit index (CFI), normed fit index (NFI), and goodness-of-fit index (GFI) ≥ 0.9; the adjusted goodness-of-fit index (AGFI) ≥ 0.8; and the root mean square error of approximation (RMSEA) ≤ 0.08.

By evaluating the construct validity of our research instrument using CFA, SEM was systematized to analyze the path between intention and other variables according to the two aforementioned PMT combinations. Respectively, the original and extended models, both showed good fits—χ^2 (chi-square) ≤ 3—based on the estimation of maximum likelihood (ML). This fact is further supported by good approximate fit indices. Correspondingly, the original model showed very good fit criteria, and similarly, in the extended model, the same outcomes with slightly inferior rates were captured (Table 3).

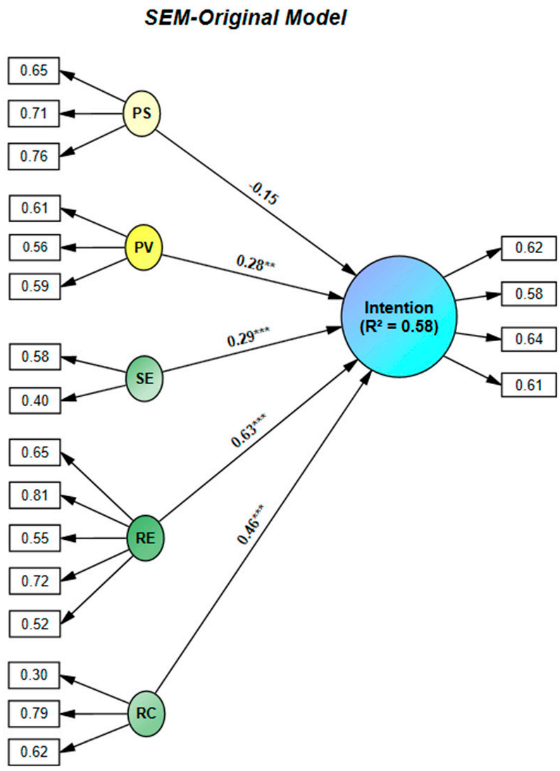

Figure 4. The original SEM-based model (** $p < 0.01$, *** $p < 0.001$).

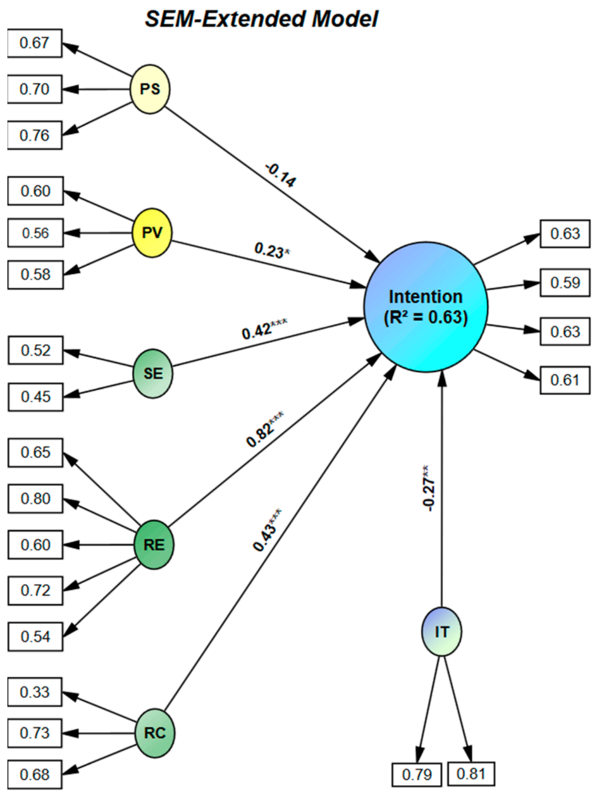

Figure 5. The extended SEM-based model (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

Table 3. Approximate fit indices (SEM).

	Indexes	RMSEA	Cmin/df	CFI	NFI	IFI	GFI	AGFI
SEM	Recommended value	≤0.08	≤3	0.9≤	0.9≤	0.9≤	0.9≤	0.8≤
	Original PMT	0.07	2.7	0.931	0.896	0.932	0.889	0.838
	Extended PMT	0.07	2.8	0.921	0.884	0.922	0.872	0.817

Based on the measured effects of the estimators (on intention), apart from the PS, all the factors showed a significant influence on the intention to save water both in the original and extended models (Table 4).

Table 4. The effects of estimators on intention.

		Original Model		Extended Model	
	Reg.coe	**β**	***p***	**β**	***p***
Factor PS		−0.149	0.236	−0.143	0.289
PV		0.281	0.001	0.233	0.013
SE		0.287	<0.001	0.416	<0.001
RE		0.633	<0.001	0.819	<0.001
RC		0.456	<0.001	0.429	<0.001
IT				−0.266	0.005

Interestingly, the outputs of the extended model projected a considerable increase in the rate of the relationship between intention and SE, as well as RE, after the contribution of institutional trust. Furthermore, while the predictors of intention in the original model explained 58% of its variance, they revealed a better estimation rate, 63% of its variance, in the extended model. This value strongly increased the role of institutional trust in increasing the intention to save water, which is related to efficacy parameters. On the other hand, contrary to expectation regarding the effect of cost on intention, this did not show up as negative in the outputs. Indeed, contrary to assumptions, institutional trust revealed an inverse relationship with intention.

The SEM-based analysis was even further revitalized using estimations in association with the proximity to the lake which, to date, have not been considered in the water-saving behavior studies for the ULB. According to the literature, specific contextual characteristics and personal experiences may also interfere with risk perception and adaptation to prevailing conditions. For instance, residential proximity to a water body is reported as a significant factor in understanding the water body and the risks related to it [78,79]. Our work thus tackled an extra hypothesis about the moderating role of distance from the lake. Accordingly, it was assumed that "the distance from the lake does not have a significant effect on the determinants of intention". In other words, the distance of a farmer's residence from the lake does not affect the performance of factors affecting a farmer's intention to save water. If this hypothesis can be rejected, the possibility that proximity affects intention is significant enough to be considered. Statistically, this means that there is a significant difference between the unconstrained (base) and constrained (hypothesized) model.

Within the region, based on the distance from the lake, 32% of the farmers live very close to the lake (up to 5 km) ("Near"), 43% live between 5 and 10 km of the lake ("Middle"), and the rest are located over 10 km from the lake ("Far"). A "multi-group analysis" was conducted, which showed some peculiar results. In a first step, the null hypothesis was rejected based on the correctness of the basic (unconstrained) model. In this regard, the difference between the degrees of freedom of the two models was 12, with a chi square of 21.579 and a p-value of 0.043, which shows the significance of the difference between the unconstrained and constrained models. Then, the effect of proximity to the lake was investigated in the three groups "Near", "Middle", and "Far". The results showed that the effect of proximity to the lake was greatest on the "Middle" group. For farmers in the "Far" group, however, the relationship between proximity to the lake and the estimation of intention factors was not significant at all. The results of this analysis showed that in the "Middle" position, the effect of proximity was especially noticeable from the significant effects of SE, RE, and RC ($p < 0.001$), even more so regarding institutional trust ($p = 0.02$) and PV ($p = 0.03$). Regarding intention, however, the relationship between PS and intention was not significant ($p = 0.1$). Nevertheless, in the "Near" field, variables were less sensitive to proximity. For example, in addition to PS ($p = 0.99$), PV ($p = 0.189$) also did not show a significant relationship with intention. Similarly, the significance of the relationship of institutional trust with intention was lower compared to the "Middle" position ($p = 0.06$). However, both RE and RC remained in the same situation ($p < 0.001$) as the "Middle" group, and SE ($p < 0.02$) still had a significant relationship with intention.

5. Discussion

The Urmia Lake region, with a mean annual winter temperature of below −10 °C and a mean summer temperature of around 40 °C, is classified as having a Mediterranean pluviseasonal–continental climate [122]. The region has been used for agricultural and animal husbandry for millennia [123]. While, historically, climatic fluctuations have been experienced in both wet and dry periods [124], the impact of the recent prolonged droughts has been more significant [125]. Social-ecological systems rely to a large extent on balancing mechanisms for the dynamics of their systems to be sustainable. In developing areas, however, there is a debate as to how best to balance environmental and development needs [126]. In such contexts, a severe early-phase problem, such as paying for the daily necessities of life, can be more visible/influential than the later consequences of environmental disasters. In the ULB, it is significant that while the agricultural sector requires a large amount of water, this need is, in fact, contributing to the disappearance of the lake, and in due course, the region as a whole will suffer adverse effects. Governmental interventions are addressing the problems by expediting arrangements for the lake restoration. To make these strategies work over the long term, the cooperation of the farmers is required. The farmers' cooperation is thus a major determinant of success. Farmers' intentions should thus be analyzed in depth, as this will further facilitate cooperation, which is vital given the status quo regarding CC, the reduction in the waters of the lake, the environmental effects of the drying, as well as the farmers' own belief that water is becoming scarcer.

Trust-based communications can boost information within farmers' community [127,128], with trust playing the role of a "promoter of acceptance". Trusted communications would be able to draw a picture of future conditions linked to the dramatic decline in water resources and lake volume. It can also be pointed out in such communications that lake loss will adversely affect the whole region at a certain point. Moreover, the government is aiming to solve the problems by ordering the expedited restoration of the lake, and for the long-term implementation of these strategies, the cooperation of farmers is essential. The establishment of joint "trust in the information source", "threat perception of resource status", and "efficient and feasible solutions" can lead to farmers' decisions to undertake water- and environment-saving strategies. The design of government policy and regulations to protect lakes and water resources should thus take into account (i) farmers' perceptions of both the risks associated with the drying of Urmia Lake and their adaptation strategies, and (ii) the need for increased trust in the institutions communicating the risk and proposing solutions to deal with it.

In line with this concept, research was formulated to acquire evidence-based information to assist in the development of feasible policies based on empirical data. A dedicated study was undertaken to identify tools able to assess farmers' perception of risk with respect to the drying-up of Urmia Lake and the deterioration in water resource supply and quality in the region. The PMT is an exceptional tool for this purpose, as it incorporates components of risk and a well-defined appraisal of both threats and coping. Moreover, the PMT showed its flexibility in terms of using context-based variables in its evaluation mechanism [83], as well as the ability of its framework to embrace institutional trust in different fields [90,129,130].

To sustain top-down provisions to save water and maintain the existence of the lake in the region, bottom-up actions are indispensable [131]. However, to make this setup work as smoothly as possible, institutional trust can play a critical role [98]. The research thus aimed to evaluate the function of institutional trust by incorporating it in the original structure of the PMT. Both models satisfied the requirements of the analytical device relating to fit indices. Based on the results, apart from the PS, all the (latent) variables were shown to be significant predictors of water-saving (protective) intention. Notably, whereas PV and RC in both models maintained the relationship with intention in almost the same ranges, the coefficients of RE and SE projected a considerable rise in the extended model. Furthermore, the extended model accounted for 63% of the variation of (protective) intention, while the original model accounted for 58%. This increase endorsed the inclusion of institutional trust in the PMT framework, increasing its predictive power in our case.

The results revealed response efficacy (RE) to be the strongest predictor of intention to conserve the water/lake. RC and SE ranked second and third, respectively. These results can be well characterized by disclosing the results of multigroup analysis to assess proximity to the lake. Based on the results of this evaluation, the "Middle" group showed more connection with the proximity of the lake than the others. Indeed, this feature seems reasonable if the comparison is applicable only to the "Far" and "Middle" groups. However, the fact that the influence of proximity (to the lake) on the intention to conserve water of the "Near" group also ranked below the "Middle" group may raise questions.

These results are, in fact, mainly related to the appraisal of risk and coping. Farmers who live near the lake are the ones with the least benefit from surface water resources. They, more than any others, face the destruction of the lake. Thus, the PS about the state of the lake has already exceeded the threshold of perception in their cognition process. In addition, their perceived vulnerability (PV) has become distorted by their prolonged experience of water scarcity and by the frequent incursions of salt dust. They thus consider themselves as already being "inside the problem" of PV; they have moved on and are trying to introduce a coping strategy to manage the needs they have, including water. However, their agenda may be more concerned with seeing to their immediate needs than saving the lake (development versus environmental needs). Thus, coping factors that connect to water (self-)management practices in particular remain stronger than risk perception factors for the "Near" group. Although institutional trust was not a statistically significant determinant of intention in this population, its effect cannot be fully judged based on the p-value (0.06). Logically, institutional trust may oscillate between "high" and "low" because the government is hardly able to provide the expected minimum of water, despite its promises; farmers and the local population still need government support, and they rely on solutions provided by government instruments to combat the effects of disappearing lakes and dust storms. Additionally, as mentioned, the "Near" group sample was smaller than the "Middle" sample, which may indicate sample size issues in the estimates.

It is clear why the "Far" group, which had greater access to surface water sources, did not show any relationship with the proximity to the lake. As mentioned, the "Middle" context reflects the greatest sensitivity to the proximity of the lake. This group of farmers was further away from the lake and at the same time had less access to water resources than the "Far" group. Therefore, this group reflected the conservative intention, namely to conserve water and the lake. Even though their intention was not significantly connected with PS, their perceived vulnerability (PV) was significant, as the amount of water they were able to obtain became less attainable. Here, the importance of PV is related to the reduction in rainfall and access to water, more encounters with salt dust storms than in previous years, temperature anomalies, and so on. In addition, their coping phase factors (RE, RC, and SE) showed stronger relationships with their intention compared to other groups, and the importance of institutional trust was reflected in their group. This group appears to be the most compliant community in terms of following government actions regarding lake restoration and water conservation.

As specified in Table 4, except for the PS, the attributes of the underlying parameters—deduced from the relevant data (300 farmers)—confirmed their role as an estimator in the settings of the PMT. Furthermore, in accordance with results from other studies [87,94,132], the coping appraisal constructs are apparently more dominant estimators than the risk appraisal factors. PV, as a variable of the risk appraisal phase emphasized its significant relationship with intention, specifically among the "Middle" group. PS was not singled out as an estimator of water/lake saving intention. The explanation may be that farmers still do not realize or believe in the true consequences of the lake drying up. This stems from their partial perspective that covers only the most tangible problems and information exchange within the limited local boundaries of their residential environments. Basically, their level of education (67% without college or university degree) shows that it is very difficult for them to obtain comprehensible information from advanced sources of knowledge, such as research centers, universities, virtual university websites, and so on. On the other hand, information provided by government agencies, for security reasons, may filter out some information that raises public concerns. This can also reduce the perceived severity of the threat to the area, which is significantly related to health issues. Hence, the potential damage that could be caused by the disappearance of the lake may be obscured for the risk perception. However, the risk of unavailability of the required water can remain strong. In this context, the severity of the risk is complex.

Due to the long-term familiarity with water scarcity and drought in the region, the issue is not raised in a range that can meet the severity indicators in the knowledge of farmers. On the other hand, the farmers of the region hesitate to take responsibility for the deterioration of water resources and strongly emphasize the responsibility of the government to supply the water they need. In other words, they optimistically reassure themselves that the government can somehow solve their problems. Therefore, even though institutional trust is fully present, it inversely affects the intention to conserve water/lake. This point is clear in the relationship of institutional trust with intention, which is negative. Another aspect worth mentioning is that trust is less important in the "Near" group than in the "Middle" group. This may indicate a decrease in confidence in the competence of government programs to provide "expected" water following the growing experience of water scarcity. This can lead to reduced trust in such institutions. Despite this, if perceptions of the "expected" amount of water can be changed, to some degree, in line with CC effects through awareness raising, adaptation can be improved by enhancing perceptions about coping tools. This can be achieved by trusting the government's information about risk and countermeasures. Obviously, other factors can influence farmers' intentions, which were not investigated in this research. Further extensive research to evaluate their value for enriching the model is worth implementing.

In terms of policy implications, this study confirms the effects of the main PMT variables, except PS, on the motivation to protect water and the environment. Therefore, formulating appropriate policies to encourage the intention of farmers to protect water and the environment under the effects of CC in the ULB can benefit from these factors. Moreover, as the inclusion of institutional trust in the model increased its predictive power and the relationship of efficacy variables (RE and SE) with the intention, it is recommended that the dimensions of institutional trust be considered in such policy formulation. As observed, coping evaluation constructs convey most of the estimated weight of water conservation intention. Accordingly, RE, RC, and SE are the dominant determinants of the intention to save water in the farmers' community. Therefore, the government should adopt a comprehensive approach to strengthen farmers' information about methods of reducing water consumption and increase their awareness. This may be implemented through the educational arms of the institutions concerned, such as the Agricultural Extension Service. In fact, in addition to the goal of proposing an efficient methodology, farmers' understanding of the application of the proposed solutions (efficacy) should be characterized by government support. This scope can be enhanced by introducing low-cost adaptation techniques or cost-effective practices [19,133].

While simple individual strategies are key, government support can dramatically increase water and environmental savings. The government can facilitate and strengthen access to water through the creation of relevant and efficient infrastructure, in addition to injections of appropriate loans or subsidies to review water saving plans at the farm level. This service can be especially suitable for the community of farmers who are far from water sources and close to the lake. Although financial and monetary support from the government is important, it should not be the main goal of projects in the field of institutional assistance. Instead, the main focus should be on the cognitive barriers affecting the adaptation process in the farmers' community. To solve this issue, policies should be designed to meet awareness-raising goals with their associated courses of action [72]. Considering the government's role in persuading actions toward water conservation, trust in government institutions is decisive for strengthening the degree of farmers' belief in government actions. Therefore, maintaining institutional trust at a secure level should be considered as an essential element in policy formulation.

After discussing the PMT variables related to the policy field, this research can express other aspects resulting from the influence of proximity to the lake. In the light of multi-group analysis, it is recommended that policies be prepared more proportionately. The results of the evaluation show that residents of different districts can have different perceptions based on their proximity to the lake and water sources. Accordingly, the "Middle" group showed a significant perception of vulnerability, while the others did not. Moreover, institutional trust and other related factors were more meaningful for this group. This may indicate that this group is more willing to accept proposed regulations to save water and the environment. Hence, farm-level support by the government can facilitate the adaptation process, while in the "Near" category, institutional trust is prone to be overlooked. This may be due to the feeling of hopelessness from not having regular access to water, in addition to the stress of recurring dust storms, which may collectively make this group feel neglected. As a result, policies need to be implemented that make large investments in transferring water to their regions and strengthening their confidence in guidelines that may save water in their agriculture. Of course, both "Middle" and "Near" communities should be supported by individual-level grants, as discussed. Although the results showed a dissociation between determinants and intention in the "Far" group, the authors also had concerns about the issue of sample size that could be propagated in the attribute calculations. However, the fact that this group has the dominant access to water resources with the least noticeable effects of lake drying cannot be ignored. Likewise, policies could consider a restrictive approach through fines or other means to control water use in their areas. After all, crop change policies can be applicable to all groups.

6. Conclusions

The PMT model was successfully examined in this research, and insights into its use were provided. The model investigated the water-saving intention of farmers in a severely CC-impacted basin (ULB). The outcomes illustrated that efforts to motivate the farmers to save the water and lake that are instigated by public/governmental instruments can achieve reasonable outcomes if the process of motivation toward conservation is designed and implemented in a sound manner. As well as governmental planning aiming to incorporate the immediate provisions, the lake can be sustainably protected by the farmers voluntarily saving water, provided that they are well briefed and they consent to the measures applied. A huge effort is needed by both macro/meso (organizational) and micro (individual) level players for successful outcomes.

Hence, a detailed strategy to broaden farmers' PS by increasing their level of awareness about the side-effects of Urmia Lake vanishing should be initiated at the basin level. Accordingly, the appropriate techniques for water-saving (RE) should be extensively explained to help farmers realize the procedures for water saving and adopt the appropriate methods based on their own self-efficacy. The costs in relation to these water-saving processes (RC) should be supported by proper financial aid (e.g., loans) from financial institutions (e.g., banks). Moreover, the cognitive barriers should be overcome regarding institutional trust to make farmers aware of the limited availability of water resources and the possibility of its reasonable supply by the government. On the other hand, the effect of institutional trust is important in communication and acceptance by farmers of the risks of Urmia Lake disappearing and of the water-saving solutions needed to help the lake's restoration. Thus, this factor should be taken into account, particularly in relation to the farmers whose location is "Near" to the lake and who have low access to surface water resources. To this end, the government should try to maintain the "Near" group farmers' institutional trust by investing in water infrastructure and ensuring a fair water supply in their area.

Farmers as micro-level players should be well aware of the importance and necessity of conserving Urmia Lake, which can be implemented by sparing agricultural water consumption. Therefore, the perceptions, cognition, and experiences of the farmers regarding the ways in which the lake and water resources are deteriorating, along with the actions related to them, can support the drawing up of improved and appropriate plans to cope with the situation. This, in turn, can lead to a fruitful system of cooperation between government institutions and farmers.

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